

# Research on the Integration and Collaborative Development of Discipline and Speciality in Application-Oriented Undergraduate Colleges

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**Abstract**—This paper deeply analyzes the connotation, relationship, existing problems, necessity and feasibility of discipline construction and professional construction, discusses the integrated and coordinated development of majors and discipline construction in application-oriented undergraduate colleges, puts forward the basic principles, development models, and strategies of integrated and coordinated development, and provides reference for the construction and implementation of the integrated and coordinated development of disciplines and majors in application-oriented undergraduate colleges.

**Index Terms**—Applied undergraduate; Collaborative development; Discipline; Integration; Speciality

## I. INTRODUCTION

As society enters a stage of high-quality development, the pursuit of high-quality economic development and high-quality education development has become the top priority of national development. As an application-oriented undergraduate university, building a high-quality education system is a new requirement given by the times, and it is also the need for its own development and transformation. The construction of application-oriented undergraduate colleges is obviously different from the construction of traditional academic universities. Academic colleges and universities generally have a long construction time, a relatively complete discipline system, a rich teaching team, a clear direction of discipline research, and strong theoretical innovation research ability based on the discipline system. Compared with the discipline construction of application-oriented undergraduate colleges, there are problems such as lack of obvious characteristics of discipline direction, fewer high-level faculty teams, and weak scientific research and innovation capabilities in terms of discipline foundation, faculty team and organizational construction.

This paper takes the current situation of discipline construction in application-oriented undergraduate colleges as the starting point, analyzes the problems existing in the construction of discipline-professional integration in the process of application-oriented undergraduate colleges, and puts forward innovative strategies for the integration of disciplines and majors, in order to effectively promote the construction of disciplines in the construction practice of

application-oriented undergraduate colleges, better serve talent training and professional construction, and achieve connotative development.

## II. CONNOTATION AND RELATIONSHIP

### (1) The connotation of discipline construction

To clarify the connotation of discipline construction, we must first clarify the concept of discipline. The definition of a discipline is "the classification of academics, that is, the classification or teaching subject of a certain scientific field or a science, that is, the basic unit of teaching content." "The classification of disciplines is a powerful means to make education targeted, forming a unique and relative knowledge system. It can be seen that disciplines are the basic elements of modern universities, and first-class disciplines are the main competitiveness of modern universities. The "Outline of Education Plan" puts forward "continuously optimize the structure of higher education, optimize the specialization, type, and hierarchy of disciplines, and promote the cross-integration of multiple disciplines", which further explains the importance of discipline construction in the high-quality development and connotative development of colleges and universities.

Discipline construction is a process of relying on certain discipline talents, long-term and multi-directional research on a certain discipline or certain disciplines, and finally achieving the improvement of scientific research capabilities, service personnel training, and promotion of social development, which also requires certain hardware facilities and software facilities as support. In addition to the connotations of discipline positioning, discipline planning, discipline setting, etc., the connotation of discipline construction in colleges and universities also includes team building, platform construction and other guarantee connotations, and its function focuses on talent training, serves scientific research, realizes high-quality development of education, and ultimately promotes social development and progress.

### (2) The connotation of professional construction

A major is defined as "a category of studies into which a higher school or a secondary specialized school is divided according to the needs of the socio-professional division of

labor."

The major is a set of systematic course combinations produced in order to make knowledge better and more targeted to serve the public, meet the social division of labor, and take social occupation as the way out.

The three major questions of modern pedagogy: for whom to train people, what kind of people to cultivate, how to train people, and what kind of people to cultivate answers the necessity of professional construction? The first function of colleges and universities is to cultivate talents, and professional construction is based on this foundation to serve talent training, mainly reflected in the goal of talent training and the matching curriculum system. Professional construction is a process based on the law of social demand and the law of pedagogical development, focusing on a certain or certain majors, continuously optimizing the layout and structure of the major, clarifying the goal of talent training, and adjusting the talent training plan to accurately cultivate talents needed by society. Therefore, professional construction is a bridge connecting teaching and scientific research, talent training in universities is mainly carried out through majors, talent training is inseparable from professional development, professional construction is the key to cultivating students, but also for the development of scientific research to provide follow-up talent reserves. Generally speaking, the content of professional construction in colleges and universities includes not only adjusting and optimizing the layout of majors, key majors, and construction of characteristic majors, but also formulating training goals, formulating teaching plans, carrying out curriculum construction, teaching material construction, faculty construction, experimental training platform construction, etc.

(3) The connection and difference between discipline construction and professional construction

The effective cultivation of high-quality talents comes from discipline construction and professional construction. The connection between discipline construction and professional construction is mainly reflected in the following three aspects:

First, the construction of disciplines provides a foundation for professional construction. On the one hand, the construction of disciplines can promote the construction and optimization of discipline talent teams, and greatly promote the experience and growth of discipline leaders. On the other hand, the construction of disciplines has also improved the scientific research level and education and teaching ability of the teaching team, and cultivated a group of teaching experts and teaching experts, which to a certain extent condenses subject knowledge, promotes curriculum construction, improves teaching methods, is conducive to professional construction and curriculum development, and provides supporting conditions for professional construction.

Second, professional construction provides a platform for discipline construction. On the one hand, the professionally

constructed faculty can promote the construction of related disciplines with their own experience, optimize the discipline construction team, and provide them with practical accumulation and knowledge support. On the other hand, further research on curriculum construction can solidify the research results of disciplines, open up the field of discipline construction, and promote the progress and improvement of discipline construction.

Third, the joint effect of discipline construction and professional construction is to cultivate high-quality talents. From the connotation of the two, whether it is discipline construction or professional construction, its primary purpose is to better cultivate high-quality talents needed by society, and its main activities are also carried out around this purpose, at the same time, these two are also the internal cornerstones of the high-quality development of education.

The differences between discipline construction and professional construction are mainly reflected in four aspects: the ability focus of cultivating talents, the requirements of the teaching team, the training of talents, and the issuance of certificates.

First, the focus of ability to cultivate talents is different. The discipline construction system focuses on cultivating students' ability to explore and innovate, and uses heuristic teaching to give full play to students' subjective initiative, so that students can actively discover, analyze and solve problems; The professional construction system focuses more on relying on social survival to improve students' vocational ability and professional quality.

Second, the programs for cultivating talents are different. The discipline construction system mainly aims at the cultivation of students' research level, and this training process mainly relies on inquiry courses based on scientific research activities. The professional construction system, on the other hand, focuses on the development of students' vocational abilities, and this process mainly relies on courses that focus on productive labor activities.

Third, the requirements for the teaching team to cultivate talents are different. The discipline construction system requires a higher level of teachers—high-level talent teaching team, whose teaching team must not only have the professional ability of teachers to educate people, but also have the ability of scientific research and inquiry, which can not only impart knowledge to students, but also lead students to enter the road of scientific research on the basis of strengthening their own scientific research ability; The professional construction system requires the teaching team to have the professional ability level and professional ability of the corresponding industry, that is, dual-teacher teachers.

Therefore, discipline construction and professional construction should not replace and integrate with each other, but should be based on clear differences and connections between the two, overall planning, coordinated development, and overall progress.

### III. EXISTING PROBLEMS

Application-oriented undergraduate colleges aim to serve regional economic and social development, and strive to cultivate high-quality talents for local areas. Although most of these universities are not "double first-class" universities, they also have a certain number of first-class professional points, so they not only shoulder the responsibility mission of running first-class undergraduate majors, but also have the internal motivation to catch up with first-class disciplines and even first-class universities. Disciplines and majors are the foundation for the survival and development of colleges and universities, and it is imperative for application-oriented undergraduate colleges to take this as the focus of construction. At present, the integration of disciplines and majors in application-oriented undergraduate colleges mainly faces the following problems:

#### (1) There are differences in functions and missions

The goals and priorities of discipline construction and professional construction are different. Discipline construction focuses on academic functions, and pays attention to whether the academic team and scientific research conditions of the discipline can well support the development of the discipline direction, and the construction goal is often to benchmark the "double first-class" construction requirements. The professional construction focuses more on the function of talent training, focusing on whether the graduates trained can meet the needs of economic and social development, and the construction goal focuses on the standard of "first-class undergraduate".

#### (2) It is difficult to synchronize planning and construction

In application-oriented undergraduate colleges, the tasks of discipline construction and professional construction are generally undertaken by the two departments separately and completed independently, so there are certain difficulties in overall coordination; At the same time, because the construction of disciplines and majors are carried out around their respective evaluation cycles, it is difficult to achieve synchronous planning and integrated construction.

#### (3) The development of the two is not coordinated

Affected by the school-running funds and school positioning, some colleges and universities with the goal of catching up with and surpassing the "double first-class" have much higher discipline construction funds than professional construction funds, but the high-quality resources of disciplines have not been well transformed into professional school-running advantages. Similarly, although some application-oriented undergraduate colleges have majors with strong advantages due to historical accumulation, they have not become bigger and stronger disciplines on this basis. Therefore, there are two extreme phenomena in application-oriented undergraduate colleges: "small majors in university subjects" or "small majors in large majors".

In summary, there has been a long-term incongruity between disciplines and professional construction in application-oriented undergraduate colleges. This not only leads to separate and duplicate construction of discipline construction and professional construction, but also makes the development of disciplines and professional development

unbalanced. Strengthening the integration of disciplines and majors will help improve the quality and efficiency of application-oriented colleges. Therefore, application-oriented undergraduate colleges should actively explore the integration of disciplines and majors, in order to form and improve the school-running strategy of mutual promotion and coordinated development of disciplines and majors, so as to provide ideas and references for the discipline and professional construction of application-oriented undergraduate colleges.

### IV. THE NECESSITY AND FEASIBILITY OF INTEGRATED AND COORDINATED DEVELOPMENT

#### (1) Necessity

A. Contribute to resource savings, efficiency and collaborative innovation

Whether it is discipline construction or professional construction, it will generally focus on improving the structure and expanding the function. Although the construction content of disciplines and majors is different, they are essentially centered on elements such as people, finances, and materials. Therefore, only by synchronous planning and implementation of integrated construction of discipline construction and professional construction can we avoid duplicate investment in talent teams, instruments and equipment, platform bases, social services, etc., and concentrate limited resources to focus on breaking through the major bottlenecks faced by the development of disciplines. At the same time, the integration of disciplines and specialties is easier to achieve resource sharing, complement each other's advantages, and form a synergy effect of interactive empowerment, so as to provide high-quality and efficient guarantee for cultivating top-notch innovative talents.

B. Contribute to the creation of a good education ecology

Educational ecology refers to a balanced state in which various elements inside and outside the educational organization influence and restrict each other. Promoting the integration of disciplines and specialties is conducive to the benign development of this educational ecology. Strengthening the construction of undergraduate majors can improve the level of undergraduate education and then cultivate excellent undergraduate graduates. Among them, some undergraduate graduates choose direct employment and are favored by employers because of their top-notch workplace competitiveness; the other part continues to study and become a high-quality source of graduate students in the discipline, creating more academic achievements for the discipline by improving its own innovation ability. Whether it is employment or further study, the excellent performance of undergraduate graduates will bring a good social reputation to their alma mater, thereby attracting more outstanding teachers and high-quality students at home and abroad to join, and then giving birth to more "golden teachers" and "golden courses" to promote a new round of professional construction and promote the continuous improvement of undergraduate teaching quality. In the process of the integration of disciplines and majors,

disciplines and majors promote each other, spiral upward, and start again and again, forming a good education ecosystem.

#### (2) Feasibility

##### A. There are similar construction elements

The essence of the integration of disciplines and majors is to integrate disciplines and majors as a whole, and integrate the common elements of the two. Although the content of discipline construction and professional construction is not completely consistent, a large number of similar construction elements can still be excavated. The first is to jointly complete the exploration, discovery and synthesis of unknown knowledge, as well as the dissemination and application of knowledge, through the academic team and the teaching team, and the construction of the two teams is synergistic and integrated. Second, by continuously promoting the integration of science and education, we will promote the mutual transformation of scientific research resources and talent training advantages, and realize the condensation of discipline research direction and the planning of professional curriculum system. The third is to enhance students' innovative spirit, project awareness and management ability as the starting point, and promote the co-construction and sharing of academic platforms and practical teaching bases.

##### B. Symbiotic soils

With the continuous advancement of the construction of a strong country in higher education, the state has introduced a series of strategic measures. In this context, application-oriented undergraduate colleges should take the initiative to reflect and reposition, abandon the speculative mentality of prioritizing one over the other, put discipline development and professional construction in the same important strategic position, plan the integration of disciplines and majors from a larger pattern with updated concepts and longer-term vision, and cultivate fertile soil for the symbiosis and common growth of the two. Only when disciplines and professions support and penetrate each other and produce co-effects can we ultimately achieve common prosperity.

### V. INTEGRATED DEVELOPMENT STRATEGY OF DISCIPLINES AND MAJORS

Under the new purpose of running the school, innovative ideas and research on the strategy of integrating disciplines and majors are of special significance to the comprehensive construction of application-oriented undergraduate colleges.

#### (1) Basic principles

Adhere to fundamental standards, establish clear orientation, improve new standards for talent training in the new era, create a new environment for talent growth, and optimize new quality assurance mechanisms; Adhere to the integration of education and training, open up the link of talent growth, and organically connect the elements of all links of education and training; Adhere to both hard and soft, adapt to the needs of information conditions, distinguish construction tasks, systematically optimize processes, rationally allocate resources, scientifically rationalize mechanisms, maximize the potential of school-running, and

enhance school-running strength; Adhere to openness and integration, and break down barriers such as concepts, institutions, disciplines, and regions.

#### (2) Collaborative development model of discipline and professional integration

Guided by the basic principles, the integrated development model of disciplines and specialties is constructed based on the collaborative theory, and the construction of discipline-professional integration is carried out. Specifically, it is to establish the concept of the development of the integration of disciplines and specialties, select disciplines and professional development directions with certain foundation and characteristics, rely on the construction of discipline platforms and professional conditions, take the integrated construction of discipline professional teams as the basis, and take the integration construction of courses as the starting point, comprehensively promote the process of integrated construction of disciplines and specialties, and serve the cultivation of high-quality talents, training innovation, science and technology incubation, academic research and practical application.

#### (3) Integrated development strategy of disciplines and majors

##### A. Establish the concept of integrated construction of disciplines and majors, and do a good job in top-level design

To carry out the integration of disciplines and specialties, we must first build ideologically. In the new stage of development, the whole institute, from leaders to ordinary teachers, must eliminate the previous view of focusing on development, establish the concept of paying equal attention to discipline construction and professional construction, coordinate development, coordinate layout, and jointly promote. Integrate scientific research into teaching, use discipline construction and development to drive professional construction and development, and incorporate professional construction content into the discipline construction system. Realize that the main majors are supported by advantageous disciplines, and the advantageous disciplines reflect the high quality of talent training.

##### B. Based on curriculum construction, implement the integration of disciplines and specialties

Curriculum construction has an intermediary status and core role in the construction of disciplines, and the key link of curriculum construction should be grasped to promote the integration of disciplines and majors.

First, in scientific research topics, some of the simpler scientific research content can be transformed as much as possible to make it a part of classroom teaching, which can not only keep up with the frontier and practical application of science and technology, but also improve students' interest in learning and sense of learning goals, and cultivate their scientific literacy; For the slightly more complex part of the research, students can be encouraged to participate in the research by setting up course design, case design, open experiments, etc., so as to improve their innovative research



ability and engineering practice ability; At the same time, it can also allow students to exercise their practical hands-on ability in the way of competition, so that the theoretical part of the professional course and the engineering ability in scientific research can be organically combined.

Second, it can solidify the content that can be integrated into classroom teaching, such as carrying out teaching reform, replanning teaching design and teaching content; Carry out the construction of teaching materials, curriculum construction, etc., and promote professional construction in the form of special construction; At the same time, according to the relevance of professional goals and curriculum objectives, carry out curriculum system reform planning research to avoid the establishment of duplicate and less relevant courses.

Third, relying on the construction of key disciplines, vigorously carry out the construction and declaration of high-quality courses and first-class courses, give full play to the exemplary role of various high-quality courses, and promote the sharing of high-quality teaching resources. [7] examined the development and refinement of possible mathematical models for the intellectual system of career guidance. Mathematical modeling of knowledge expression in the career guidance system, Combined method of eliminating uncertainties, Chris-Naylor method in the expert information system of career guidance, Shortliff and Buchanan model in the expert information system of career guidance and DempsterSchafer in the expert information system of career guidance method has been studied. The algorithms of the above methods have been developed. The set of hypotheses in the expert system is the basic structure of the system that determines the set of possible decisions of the expert system. This set, which is crucial in decision-making, should be sufficiently complete to describe all the possible consequences of situations that arise in the subject area. Therefore, it is important to improve the mathematical models of the intellectual system of career guidance. [8] discussed that according to the observations in this paper, an existing mathematical model of banking capital dynamics should be tweaked. First-order ordinary differential equations with a "predator-pray" structure make up the model, and the indicators are competitive. Numerical realisations of the model are required to account for three distinct sets of initial parameter values. It is demonstrated that a wide range of banking capital dynamics can be produced by altering the starting parameters. One of the three options is selected, and the other two are eliminated. The model is generalized taking into account fractional derivatives of the bank indicators for time, reflecting the rate of their change. Based on numerical calculations, it is established that reduction of the order of derivatives from units leads to a delay of banking capital dynamics. It is shown, that the less the order of derivatives from the unit, the more delay of dynamics of indicators. In all analyzed variants indicators at large times reach their equilibrium values.

C. Emphasize the direction of traction and build an integrated team of disciplines and professions

The development of formal groups into teams is not achieved spontaneously, but is developed through conscious combination, running-in and adjustment. Teachers of application-oriented undergraduate colleges have the dual tasks of discipline construction and professional construction. In the case of the separation of the original disciplines, it is difficult to unify the two in many cases, which is easy to form a three-pronged situation of teaching team, scientific research team and academic team. Under the premise of the integration of disciplines and majors, we can give full play to the advantages of discipline groups, carefully analyze the advantages and disadvantages of existing teams, the characteristics of various talents and their research directions, research fields and research capabilities, and combine the goals and tasks of the near and long-term development of the college, rely on the subject group, take the research direction as the traction, break the boundaries of disciplines, teaching and research departments, and build an integrated team of disciplines and specialties according to the direction of disciplines and specialties to ensure that the research direction and professional construction direction of each member of the team are basically the same. In this way, the superior resources can be fully concentrated for the integration of disciplines, majors and courses, and the discipline achievements formed are closely linked with majors and courses, which can achieve the purpose of disciplines and scientific research serving professional teaching. The infiltration and flow of personnel and knowledge information of various disciplines is conducive to broadening the space for the development of disciplines, promoting the intensive development of disciplines, and forming the characteristics and advantages of running schools. At the same time, subject leaders should adhere to undergraduate teaching, and introduce academic frontiers and difficult hot spots into classroom teaching, so that students can intuitively experience the development prospects and ideas of the major; Front-line teaching workers should improve their scientific research and academic research capabilities from multiple angles, such as participating in scientific research, upgrading academic qualifications, etc., and should be conscientious to the cultivation of students; Student managers should strengthen the construction of learning style, encourage students to participate in professional-related skills competitions, competitions, etc., and further expand students' professional horizons.

D. Build subject groups around application needs

Break the accumulated disease of "each management and duplicate construction" in the past, and set up majors and carry out professional construction according to the needs of the post; Carry out scientific research and develop the characteristics of disciplines in accordance with the requirements of actual combat. In order to better build a subject group, the college can take the lead, follow the idea

of "stabilizing basic disciplines, transforming traditional disciplines, cultivating emerging disciplines, and developing characteristic disciplines", optimize the layout structure, integrate the material and human resources of similar disciplines, integrate the faculty, instruments and equipment, and venue equipment of similar disciplines into the corresponding subject group organization, improve the utilization rate of educational resources, and improve the level of scientific research. When building discipline groups, attention should also be paid to not only combining traditional advantageous disciplines, but also developing interdisciplinary and hot disciplines in response to practical needs, and improving the level of innovation and practical efficiency. At the same time, in order to develop in a good and orderly manner and truly play its role, it is inseparable from a reasonable supervision mechanism and evaluation system. A good system can make it have both tacit cooperation and fierce competition within it. The discipline system includes discipline management, discipline evaluation and incentive system. Subject management constitutes an inseparable supporting relationship between teachers, colleges and schools, and the management system should coordinate the collaborative relationship between these three in discipline planning, demonstration, construction and other joints. Discipline evaluation should establish a dynamic evaluation system, track the pre-demonstration, mid-term inspection, and post-conclusion stages of the discipline group under construction, investigate the feasibility of discipline development and the rigor of discipline construction, and reasonably evaluate the interdisciplinary and marginal disciplines in the discipline group. The incentive system rewards discipline innovation, incubation of emerging disciplines, joint research, academic exchanges, etc., and there should also be certain punishment measures for teams and individuals that are unfavorable to discipline construction. At the same time, the team of the subject group should uphold an open and inclusive tradition, build a team culture, expand the degree of communication with the outside world, and only by constantly venturing the old and accepting new things can the team members of the subject group always maintain a vigorous creative ability.

## VI. CONCLUSION

Taking the transformation of application-oriented colleges as an opportunity, this paper discusses the integrated and coordinated development of professional and discipline construction after in-depth analysis of the connotation, relationship, existing problems, necessity and feasibility of discipline construction and professional construction, starting from the basic principles and development models, and puts

forward the strategy of integrated and coordinated development. It has certain reference significance for the construction of application-oriented undergraduate colleges to realize the integrated and coordinated development of disciplines and majors.

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